

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A45D 29/00, A61B 17/54	A1	(11) International Publication Number: WO 98/02060 (43) International Publication Date: 22 January 1998 (22.01.98)
---	----	---

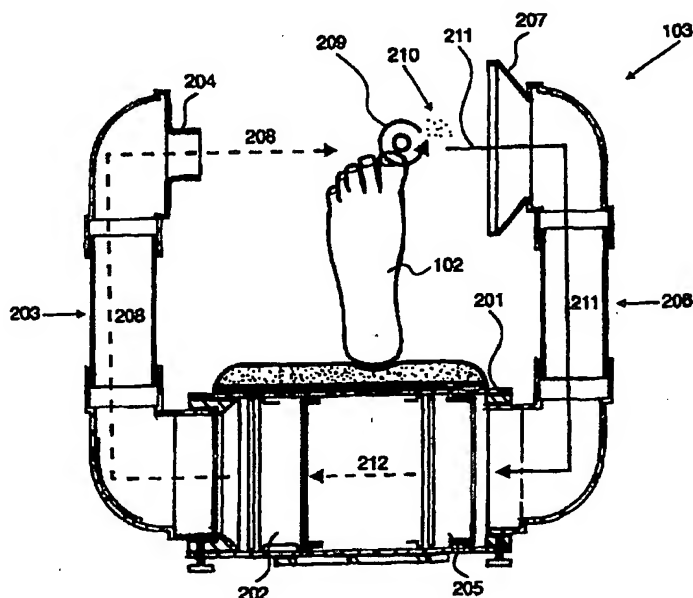
(21) International Application Number: PCT/GB97/01883

(22) International Filing Date: 11 July 1997 (11.07.97)

(30) Priority Data: 9614914.1 16 July 1996 (16.07.96) GB

(71)(72) Applicant and Inventor: TUFFERY, Donald, Edward
[GB/GB]; 1 Furze Croft, New Milton, Hampshire BH25
6NH (GB).(74) Agent: ATKINSON, Ralph; Atkinson & Co., The Technology
Park, 60 Shirland Lane, Sheffield S9 3SP (GB).(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR,
BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE,
GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ,
PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR,
TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH,
KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ,
BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE,
CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,
PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN,
ML, MR, NE, SN, TD, TG).Published
With international search report.

(54) Title: EXTRACTING PARTICLES PRODUCED BY THE TREATING OF HUMAN OR ANIMAL NAILS



(57) Abstract

Apparatus (103) for removing dust produced by the treating of human or animal nails. An air current produced by a fan (202) is directed through an adjustable conduit (203, 204) towards the nails being treated. A funnel (207) attached to a second adjustable conduit (206) leading to a filter (205) is positioned beyond the nails so that dust particles (210) are entrained by the air current and carried into the funnel and to the filter. The fan is of sufficient power to cause very fine dust particles to be removed.

BEST AVAILABLE COPY

BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MT	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

EXTRACTING PARTICLES PRODUCED BY THE TREATING OF HUMAN OR ANIMAL NAILS

5 The present invention relates to removal of dust particles produced by
the treating of human or animal nails.

Introduction

10 A common foot related problem requiring treatment by a chiropodist is
thickened nails. One method of treating this condition is to remove a part of
the nail using a grinding wheel. Chiropodists often have to visit the homes of
patients to perform this treatment as it might be too painful for the patient to
walk to a surgery. This means that the chiropodist must carry equipment with
them to the patient's home.

15 A considerable amount of dust is produced whilst performing the nail
grinding. For hygiene purposes the resulting dust needs to be cleaned. This
can be difficult if the treatment is not performed at the surgery, for example
the dust might need to be removed from carpet on the floor of a patient's
home. A potentially more serious problem is the very fine dust particles which
are produced by grinding nails. Dust particles of up to 12.0 microns in size
20 can penetrate the respiratory tract. This can cause lung problems, particularly
for a chiropodist, who is exposed to such particles frequently over a long
period of time. People with respiratory problems are also especially prone to
these undesirable effects.

25 The wearing of a surgical mask will help prevent the inhalation of dust
particles. However, it is more effective to prevent dust particles entering the
surrounding air. Known dust extraction devices for use for in the treatment of
nails rely on suction to extract dust particles. These techniques are not very
effective for dealing with very fine dust particles. The suction device has to be
positioned very close to the nail being treated in order to remove particles
30 effectively. This requirement can restrict the chiropodist's workspace for
performing the grinding and also means that the patient may have to move
their foot several times during the treatment. The resulting apparatus may

also be large and heavy and therefore not feasible for carrying for use during home visits. Some grinding wheels are fitted with dust extraction systems, but these are expensive and again rely on suction so do not effectively deal with very small dust particles.

5 It is an object of the present invention to provide a relatively low cost portable device which can extract very small dust particles from the air whilst overcoming the limitation of having to position a suction device directly by the nails being treated.

10 **Summary of The Invention**

 According to a first aspect of the present invention there is provided apparatus for extracting particles produced by the treating of human or animal nails, comprising: support means; means for generating an air current; and dust extraction means, wherein said support means is positioned
15 between said air current generating means and said dust extraction means.

 According to a second aspect of the invention there is provided a method for removing dust by treating nails comprising steps of:

 generating an air current;

 placing nails being treated in the air current; and

20 positioning a dust extraction means such that the air current carrying the dust enters the dust extraction means.

 According to a third aspect of the present invention there is provided a kit of parts for use in treating nails, comprising:

 grinding apparatus;

25 a light source;

 a socket set; and

 apparatus for extracting particles produced by the treating of human or animal nails.

30 **Brief Description of The Drawings**

 Figure 1 illustrates an embodiment of the particle extraction device in use;

Figure 2 illustrates a cross-section through the particle extraction device identified in Figure 1; and

Figure 3 illustrates an exploded perspective view of the particle extraction device shown in Figures 1 and 2.

5

Detailed Description of The Preferred Embodiments

The invention will now be described by way of example only with reference to the previously identified drawings.

Figure 1 illustrates a chiropodist 101 performing nail grinding treatment on a patient. The patient's foot 102 is shown resting on an embodiment of the present invention, portable device 103. The chiropodist uses a grinding wheel tool 104 to perform the treatment. Dust produced by using the grinding wheels on the patient's nails is intended to be removed from the surrounding air by the device 103.

It is the inventor's intention that the device 103 will be marketed as part of a portable chiropody kit. In addition to the device 103, the kit will comprise the grinding wheel tool 104 and a high power light 105 to illuminate the patient's foot. The three components 103, 104 and 105 can be plugged into a multi-socket electrical extension 106, also included in the kit.

Figure 2 of the accompanying drawings illustrates a cross-section through the device 103 with a patient's foot 102 resting on it. The device 103 comprises a support block 201, which houses a fan 202 and a filter 205, as well as functioning as a footstool for the patient. The fan produces a current of air shown by arrow 208. (From the patient's point of view shown in Figure 2). The fan 202 is a coaxial extrusion fan with a power which provides a flow rate of at least 138.2 cubic feet per minute. This flow rate is required to entrain very fine dust particles in the air current produced. The fan used in the preferred embodiment is available from RS Components, England from their 1997 catalogue, page 2 - 1408, stock number 498-081. The air current is blown through a blower arm 203 and exits the blower arm through a nozzle 204. The air current passes over the top of a patient's foot from where dust 210 is produced by the grinding of nails. The grinding wheel 104 has a grinding

30

member which rotates in an anti-clockwise direction (from the patient's point of view), shown by rotary arrow 209. This means that dust particles produced by the grinding treatment are propelled in the same direction as the air current emerging from nozzle 204. Device 103 is most effective when the direction of the air current and propulsion of dust produced by grinding are coincident, so a sign may be attached to support block 201 in order to help ensure that chiropodist and patient are positioned on the correct sides of the device to achieve this effect.

The dust particles 210 are entrained by the air current and carried towards a funnel 207. The funnel 207 is connected to a receiver arm 206 of the device. At the receiver arm end of the device, the fan 202 produces a suction effect which draws the particle-laden air current in towards the back of the fan. The particle-laden air travels down the receiver arm in the direction of arrow 211 and is led to filter 205. The filter 205 comprises a cardboard case, sized to fit inside case 201, with open ends to form a frame for a filter membrane. The filter membrane is louvered to increase its surface area in order to prevent particles greater than approximately 0.1 microns in size penetrating through it. Filters of this kind are available from 3M, Minnesota, USA. The resulting filtered air current 212 passes into fan 202 and is blown up the blower arm. The filter is configured to trap very fine dust particles, in particular those which can lead to lung problems.

Figure 3 of the accompanying drawings illustrates an exploded perspective view of the dust extraction device 103. The support block 201 is a substantially rectangular box-shaped plastic extrusion which also acts as a case for some of the device's components. The fan 202 is housed inside the support block near one end. The fan has two grilles 301, one attached to either side of the fan in order to prevent objects entering and coming into contact with the fan's blades. A power lead 318 supplies electricity to the fan.

A plastic moulded end piece 302, substantially square-shaped and substantially similar in size to the square end of support block/case 201, is fitted to the end of the support block nearest the fan and grilles. The end piece 302 has a circular orifice in its centre. The filter 205 is also housed

inside the support block 201 at the opposite end to the fan. A plastic moulding 303 (substantially similar to plastic moulding 302) is push-fitted to the other end of the support block, near the filter 205. End piece 303 can thus be easily removed to clean or replace the filter. The end moulding 302, the fan grilles 301 and the extrusion fan 202 each have four threaded holes, one in each corner. The components 301, 302 and 202 are held together by four "secret"-headed tamper-proof screws 307 threaded through their four holes.

The blower arm 203 is attached to end moulding 303. The blower arm consists of three moulded plastic components 309, 310 and 311. A plastic elbow 309 is inserted into the circular orifice in end moulding 303. The elbow 309 is a substantially perpendicular L-shaped hollow plastic moulding with a circular protrusion on one side and a rectangular orifice in its upper surface. The elbow 309 fits into the circular orifice of the end moulding 303 so that the air current produced by the fan will be directed in an upward direction through plastic elbow's 309 upper rectangular orifice.

The surface of elbow 309 may have one or more holes 317 arranged to reduce the efficiency of blower arm 203 relative to receiver arm 206. This means that the suction effect at the funnel 207, attached to receiver arm 206, is more effective for drawing in dust particles. The hole(s) 317 may be covered by a gauze to prevent dust particles escaping. A rectangular plastic tube 310 is fitted on the top end of elbow 309. Another plastic elbow 311 (substantially similar to elbow 209 but having no surface hole(s)) is fitted on to the top of hollow tube 304. A disc-mounted plastic moulded nozzle 204 is fitted into the circular orifice of elbow 311. The elbow 311 can slide vertically on the tube 310 allowing the height of the nozzle to be adjusted. The hollow tube 310 fits inside the rectangular orifices of elbows 309 and 311 so that the air current is directed up through components 309, 310 and 311 which form the blower arm 203. The blower arm 203 acts as a conduit for the air current produced by fan 202 so that the air current exits through nozzle 204 and is directed across the top of support block 201 in the opposite direction to the air current that the fan produces.

Another plastic elbow 305 (substantially similar to elbow 309 but with no surface hole(s)) is fitted to the end moulding 302 closest to the fan. This plastic elbow 305 forms a base part of receiver arm 206. A rectangular plastic tube 304, substantially similar to plastic tube 310, is inserted into the rectangular orifice of plastic elbow 305. A plastic elbow 306 (substantially similar to elbow 311) is inserted onto the top of hollow tube 304. A rounded plastic moulded funnel 207 is fitted into the circular orifice of elbow 306. The funnel 207, elbows 306 and 305 and plastic tube 304 form the receiver arm 206 of the device which acts as a conduit to lead the particle-laden air current down and back into the support block 201 filter 205 and then by recycled by fan 202. Elbow 306 can slide on tube 304 allowing the height of the funnel 205 to be adjusted.

The receiver arm 206 and the blower arm 203 can also be rotated. The circular protrusion of plastic elbow 305 can be rotated within the circular orifice of end moulding 302. End moulding 302 has a threaded brass insert leading from the bottom base of the moulding in a substantially vertical direction to the bottom of its circular orifice. A large headed captive locking screw 308 is fitted through the threaded orifice in end moulding 302. When the screw 308 is tightened it locks the plastic elbow 305 in position. The screw 307 can be loosened and re-tightened in order to adjust and fix the rotation of the receiver arm 206. The end moulding 303 located on the other end of the support block 201 also has a similar threaded brass insert to end moulding 302. A substantially identical large headed captive locking screw 308 is used to adjust the rotation of blower arm 203 in a substantially similar manner to the method described above for receiver arm 206.

A foam cushion 312 with a PVC covering is placed on the upper surface of the support block 201 for the comfort of the patient. The cushion 312 is attached to the support block by means of four Velcro tabs 313. The PVC covering means that the removable cushion is easily cleaned.

The support block 201 and all attached components are mounted on a stand 315. In the preferred embodiment this is a tripod stand with adjustable height and folding legs. A square-shaped plastic moulding 314 with a circular

hole designed to fit the top of tripod 315 is fitted to the bottom of support block 201. The plastic moulding 314 has six orifices around the inner circumference of its circular hole into which ribs on the top of tripod stand 315 can fit. The plastic moulding 314 is attached to the support block using
5 four screws 319 threaded through four holes in the corners of the moulding 314 into corresponding holes in the support block's lower surface. The height of the tripod stand can be adjusted by rotating a winding mechanism 316 so that the patient's foot/leg is held on the cushion 312 in a comfortable position.

Claims

1. Apparatus for extracting particles produced by the treating of human or animal nails, comprising:

5 support means (201);
means for generating an air current (202, 203, 204); and
dust extraction means (205, 206 207), wherein said support means is positioned between said air current generating means and said dust extraction means.

10

2. Apparatus according to claim 1, wherein said means of generating air current comprises a fan attached to a first conduit;

said dust extraction means comprises a filter attached to a second conduit; and

15 wherein said first conduit directs said air current into said second conduit.

3. Apparatus according to claim 2, wherein said conduits have adjustable length.

20

4. Apparatus according to claim 2, wherein said first conduit has a nozzle attached to its free end.

5. Apparatus according to claim 2, wherein said second conduit
25 has a round funnel attached to its free end.

6. Apparatus according to claim 1, wherein said support means is mounted on a stand.

30 7. Apparatus according to claim 6, wherein said stand is a tripod with adjustable height.

8. Apparatus according to claim 2, wherein said conduits can be rotated.

5 9. Apparatus according to claim 1, with a removable cushion attached to said support means.

10 10. Apparatus according to claim 1, wherein said means of creating air current is a coaxial extrusion fan producing a flow rate of at least 138.2 cubic feet per minute.

15 11. Apparatus according to claim 1, wherein said dust extraction means comprises a filter configured to prevent penetration of particles greater than approximately 0.1 microns in size.

12. Apparatus according to claim 10, wherein said extrusion fan has one or more safety grilles attached.

20 13. Apparatus according to claim 1, wherein said means for generating air current and said dust extraction unit are contained within said support means.

25 14. Apparatus according to claim 12, wherein said air current entering said dust extraction means is recycled.

15. Apparatus according to claim 2, wherein said first conduit has one or more holes in its surface.

30 16. Apparatus according to claim 15, wherein said holes are covered by a gauze.

17. A method for removing dust produced by treating nails, comprising steps of:

generating an air current;

placing said nails in said air current; and

5 positioning a dust extraction means such that said air current carrying said dust enters said dust extraction means.

18. Method according to claim 17, wherein said air current entering said dust extraction means is recycled.

10

19. The kit of part for use in the treating of human or animal nails, comprising:

grinding apparatus (104);

a light source (105);

15 a multi-socket electrical extension (106); and

apparatus for extracting particles produced by the treating of human or animal nails (103) according to any of claims 1 to 16.

1/3

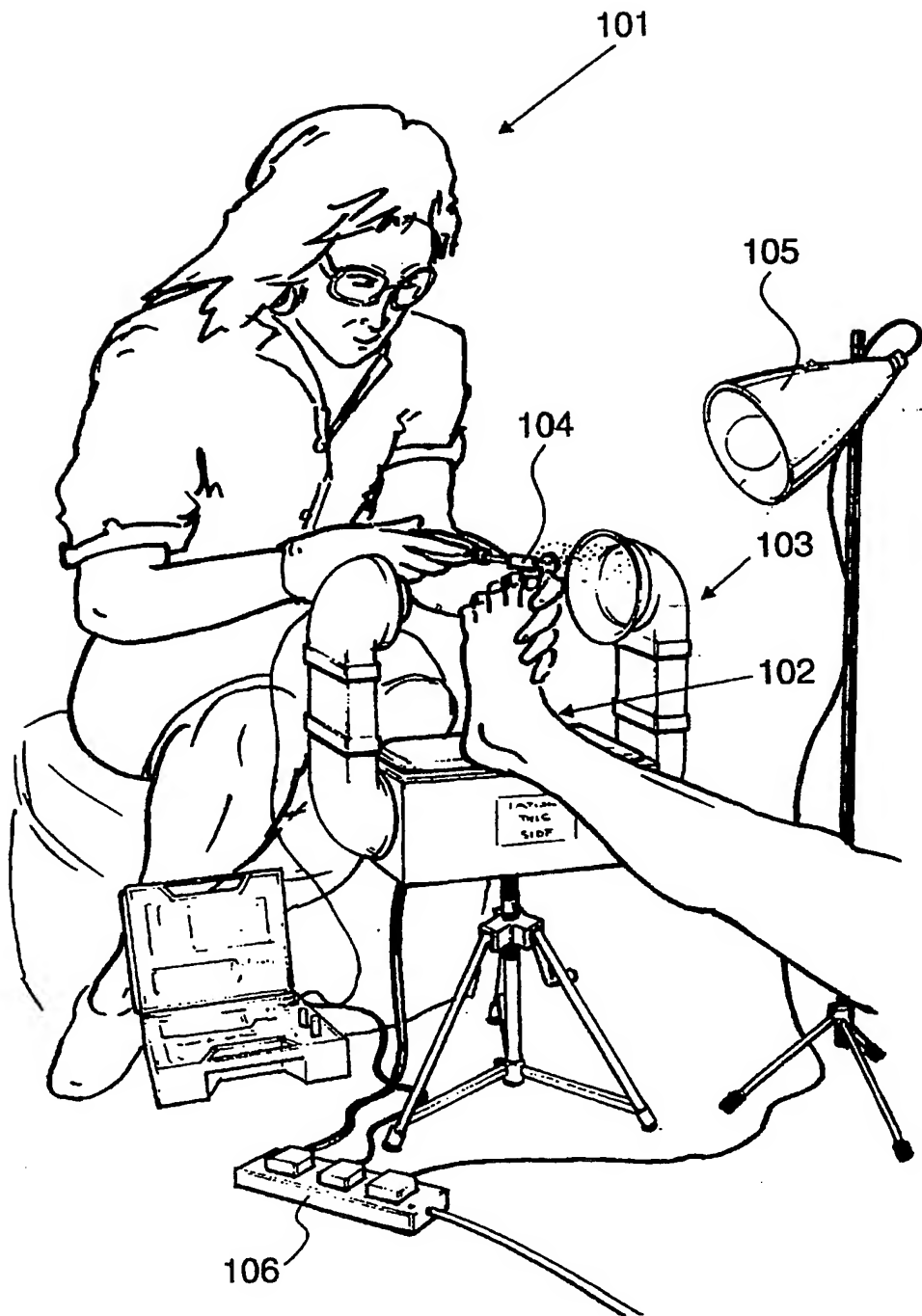
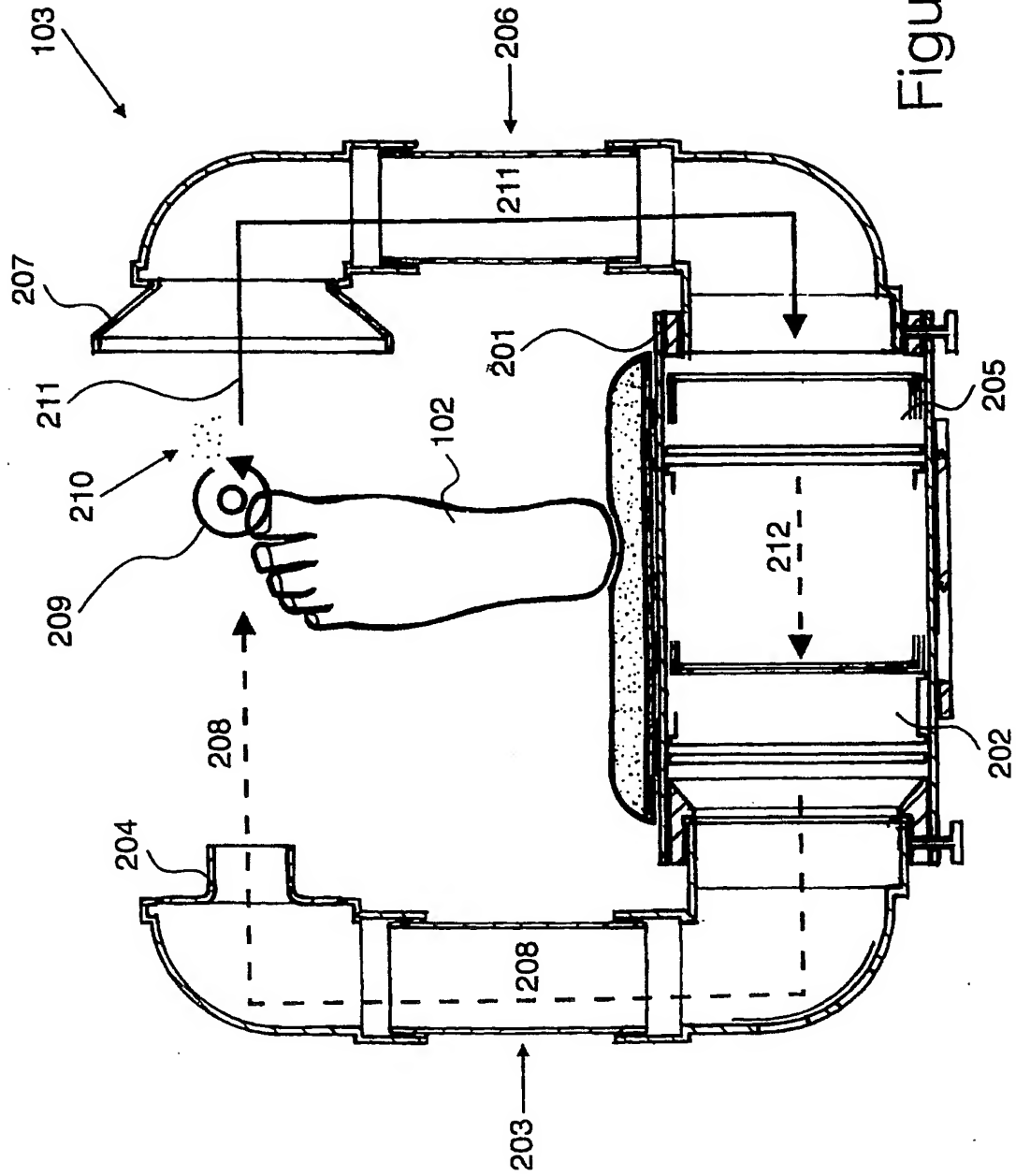


Figure 1

2/3



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 97/01883

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A45D29/00 A61B17/54

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A45D A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 85 12 617 U (REMMELE-FISCHER, GERMAN) 14 August 1985 see page 5, line 11 - page 5, line 24; figure 1	1
A	see column 5, line 11 - column 5, line 24; figure 1	5,6,8, 12,13, 17,19
A	--- US 5 336 128 A (BIRDSONG ESAU) 9 August 1994 see figures 1,4	1,17,19
A	--- US 5 139 546 A (NOVOBILSKI CARL G) 18 August 1992 see column 1, line 49 - column 1, line 57; figure 3 see column 2, line 3 - column 2, line 7 --- -/--	1,17,19



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"Z" document member of the same patent family

Date of the actual completion of the international search

7 October 1997

Date of mailing of the international search report

27. 10. 97

Name and mailing address of the ISA

European Patent Office, P.B. 5816 Patentkan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Lang, D

COPY

INTERNATIONAL SEARCH REPORT

Intern. Appl. No.

PCT/GB 97/01883

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 280 519 A (CHAPMAN VIRGINIA J) 28 July 1981 see column 2, line 19 - column 2, line 29; figure 1 ---	1,12,17, 19
A	GB 334 209 A (BELDAM-WERKE) 27 August 1930 see figure 1 -----	6,7

BEST AVAILABLE COPY

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern. Application No

PCT/GB 97/01883

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 8512617 U	14-08-85	NONE	
US 5336128 A	09-08-94	NONE	
US 5139546 A	18-08-92	NONE	
US 4280519 A	28-07-81	NONE	
GB 334209 A		DE 528171 C DE 532708 C	

BEST AVAILABLE COPY